Legumes versus Nitrogen Fertilizer to Increase Production from Warm-Season Grass Pastures

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Legumes versus nitrogen fertilizer to increase production from warm-season grass pastures

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Introduction Grass pastures in semi-humid regions often have insufficient soil nitrogen to optimize plant growth and resultant performance of grazing livestock . The two main methods of adding nitrogen to these pastures are nitrogen fertilizer or legumes . Many cool-season legumes out-compete warm-season grasses if the legume has a high plant density because they form a canopy and use soil moisture before the warm-season grasses begin rapid growth .Birdsfoot trefoil develops more slowly during spring and may cause fewer compatibility problems than other legumes .

Materials and methods Twelve 1 .35-ha pastures consisting primarily of big bluestem (*Andropogon gerardii* Vitman) , indiangrass (*Sorghastum nutans* L .) ,and switchgrass (*Panicum virgatum* L .) at the University of Nebraska Agricultural Research and Development Center near Mead ,Nebraska were grazed from mid-June until mid-August during 2001 through 2005 by six (5 in 2005) crossbred yearling beef steers (*Bos taurus* L .) weighing about 300 to 350 kg . Treatments were three replications each of 1) fertilized with 67 kg N ha^{-1} annually in late May ,2) interseeded with 6 .7 kg of birdsfoot trefoil seed (*Lotus corniculatus* L .) in early spring 2000 ,3) interseeded in early spring 2000 with a seed mixture containing 1 .7 kg ha^{-1} each of red clover (*Trifolium pretense* L .) ,alfalfa (*Medicago sativa* L .) ,sweet clover (*Melilotus officinalis* Lam .) ,birdsfoot trefoil ,and a blend of several annual medics (*Medicago* sp .) ,and 4) control . All pastures were grazed for an average of 62 days from 2001 through 2004 . In 2005 ,2 of the 5 head were removed from each control pasture after 21 days and all 5 head were removed from one legume mix pasture after 63 days due to low herbage availability caused by dry weather .All other pastures were grazed for 82 days .Randomly selected pasture samples were hand-clipped to a 5 cm stubble within three 0 .37 m^2 quadrats per pasture throughout the grazing season in 2001 ,2004 ,and 2005 .Samples were frozen and hand separated later into warm-season grasses ,cool-season grasses ,and legumes .Separated samples were dried at 70℃ for 72 hours and weighed to determine botanical composition .

Results & Discussion Steer gains during the year following interseeding were greatest from N-fertilized pastures (Table 1) , probably due to N-fertilized pastures producing nearly 25% more herbage during 2001 than other treatments (data not presented) .In all subsequent years ,birdsfoot trefoil interseeded pastures produced as much or more gain than all other treatments .

Pastures initially were dominated by warm-season grasses (Table 2) . By 2004 ,however ,invasion by cool-season perennial and annual *Bromus* species plus development of legumes in the interseeded pastures caused much lower presence of warm-season grasses (Anderson and Schacht ,2005) .

Conclusions Birdsfoot trefoil did not provide significant production until its third year of growth ,but thereafter it grew compatibly with warm-season grasses and increased its proportion of the forage production each year . As cost of nitrogen fertilizer increases ,use of birdsfoot trefoil or other compatible legumes will become increasingly cost competitive as a way to increase livestock production from warm-season grass pastures .

Table 1 *Annual average daily gain (ADG) and 5 year average gain per hectare in N-fertilized (NF) ,birdsfoot trefoil interseeded (BFT) ,mixed legume interseeded (ML) ,and control pastures .*

Pasture treatment	2001	2002	2003	2004	2005	Average ADG	Gain per hectare
	kg						
NF	0 .61	0 .67	0 .59	0 .44	0 .57	0 .53	161
BFT	0 .45	0 .64	0 .65	0 .71	0 .61	0 .56	168
ML	0 .46	0 .48	0 .46	0 .41	0 .48	0 .44	125
Control	0 .45	0 .39	0 .41	0 .38	0 .60	0 .45	111

Table 2 *Average percent dry matter yield contribution of cool-season grasses (CS) ,warm-season grasses (WS) ,and legumes (Leg) in N-fertilized (NF) ,birdsfoot trefoil interseeded (BFT) ,mixed legume interseeded (ML) ,and control pastures .*

Pasture treatment	2001			2004			2005		
	CS	WS	Leg	CS	WS	Leg	CS	WS	Leg
	%								
NF	27	73	—	87	13	—	47	52	—
BFT	39	60	1	43	15	42	41	25	33
ML	34	61	5	58	25	15	31	46	23
Control	38	62	—	63	36	—	71	28	—

Reference

Anderson ,B .E . ,& W .H .Schacht .2005 .Response of warm-season grass pasture to grazing period and recovery period lengths . p .170 .*In Utilization of grazed grass in temperate animal systems .Proc .of a satellite workshop of the XXth International Grassland Congress* .